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THE STRUCTURE AND ORIGIN OF CAVERNOUS ANGIOMATA IN THE LIVERS OF OXEN. By STEWART STOCKMAN, *Professor of Pathology, Dick Veterinary College, Edinburgh.*

(Read before the Society, January 15, 1897.)

CAVERNOUS angioma is rarely seen in the livers of animals other than the ox. It is stated in some text-books of human pathology that the lesion is commonly found in the dog and cat; my *post-mortem* experience is against this. In the livers of oxen it is nearly always—I think I may say always—associated with that form of cirrhosis caused by the *Distoma hepaticum.*

During the past few years, at the Edinburgh Abattoir I have examined about 100 livers from oxen harbouring the *Distoma hepaticum.* These livers were always enlarged and cirrhotic. It was exceptional to find the cirrhosis unaccompanied by angioma. I may say, then, that the latter lesion is as frequent as distomatosis itself.

In hepatic distomatosis of the ox the distribution of the new tissue is always more or less irregular, although fibrous patches may be found in every part of the organ. In certain cases the enlargement is confined mainly to the upper two-thirds, in others the liver is enlarged throughout its whole extent. The angiomata are seen under the capsule and in the liver substance, usually apart from the fibrous tissue. On the surface they appear as unraised areas of a slate-blue colour; in the substance of the organ they have the colour of venous blood. Their size varies from a pea to that of the fist, but the pea-sized ones are by far the most frequent. There may be only one or two present, or there may be dozens. They are least numerous in the markedly cirrhotic portions, but one sometimes sees there evidence of their former existence. The advancing fibrous tissue seems to crush them out.

The cause of the lesion I believe to be the new fibrous tissue, which, by compressing and obliterating the vessels in one region, raises the blood pressure in the non-cirrhotic parts. As a

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result of the increased pressure the capillaries become dilated. They press on the intervening liver cells, causing them to undergo atrophy and to disappear. Some of the cells seem to be washed away in the blood stream. By removal of the liver cells several capillaries come into contact by their walls. The central ones give way and vascular cavities are formed. The formation of these cavities relieves the pressure for the time being.

The microscopical examination of serial sections bears out his view. If a section be made through the angioma near its centre, one sees a number of blood-containing spaces. The spaces are not separated from each other by fibrous septa, as usually described, but by liver cells. In many cases a slightly thickened capillary wall and a single row of liver cells separate one space from another. The intervening liver cells may be so compressed that they at first sight resemble a fibrous strand under a low power, but their real character can easily be made out by using a higher magnification. The circulating blood does not come into direct contact with the liver cells; the latter are separated from it by the capillary walls at their margins. The walls can be distinctly seen. They do not usually give way until the cells have been removed. In a very few cases a vascular space surrounded by a distinct fibrous wall is found. It is usually isolated and unpartitioned. If, through the angioma, sections be made in series until healthy-looking liver is reached, one sees that the cavities become smaller and smaller. The liver tissue becomes more compact, until it takes the appearance of a small nutmeg area. These local nutmeg areas can be seen in different parts of the organ. They represent the first stage in the formation of the angioma.

The angioma is usually described as a neoplasm composed of blood-vessels. The above described formations, however, are not neoplasms, as no new vessels are formed; indeed, the reverse is the case. They are not even tumours, since they do not project. They are simply spaces hollowed out in the liver in the manner above described.

The ox is not the only animal in whose liver the fluke causes cirrhosis. The sheep is often the host of these parasites, and the horse's liver is more often cirrhotic from this cause than one admits. I have had sent to me in one year as many as three horses' livers cirrhotic from the presence of the fluke.[1]

I have never seen angioma accompanying cirrhosis in the sheep or horse. In these animals, however, the new tissue is more evenly distributed through the liver than in the ox, and I think that is why the blood-vessel lesion is absent. In the horse and sheep the vessels are certainly compressed and obliterated, but the compression takes place all over the organ.

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[1] In these livers the parasites were not numerous. At first I failed to find a single one, but after slicing the organs and leaving them over-night, a few crawled out to the cut surfaces.